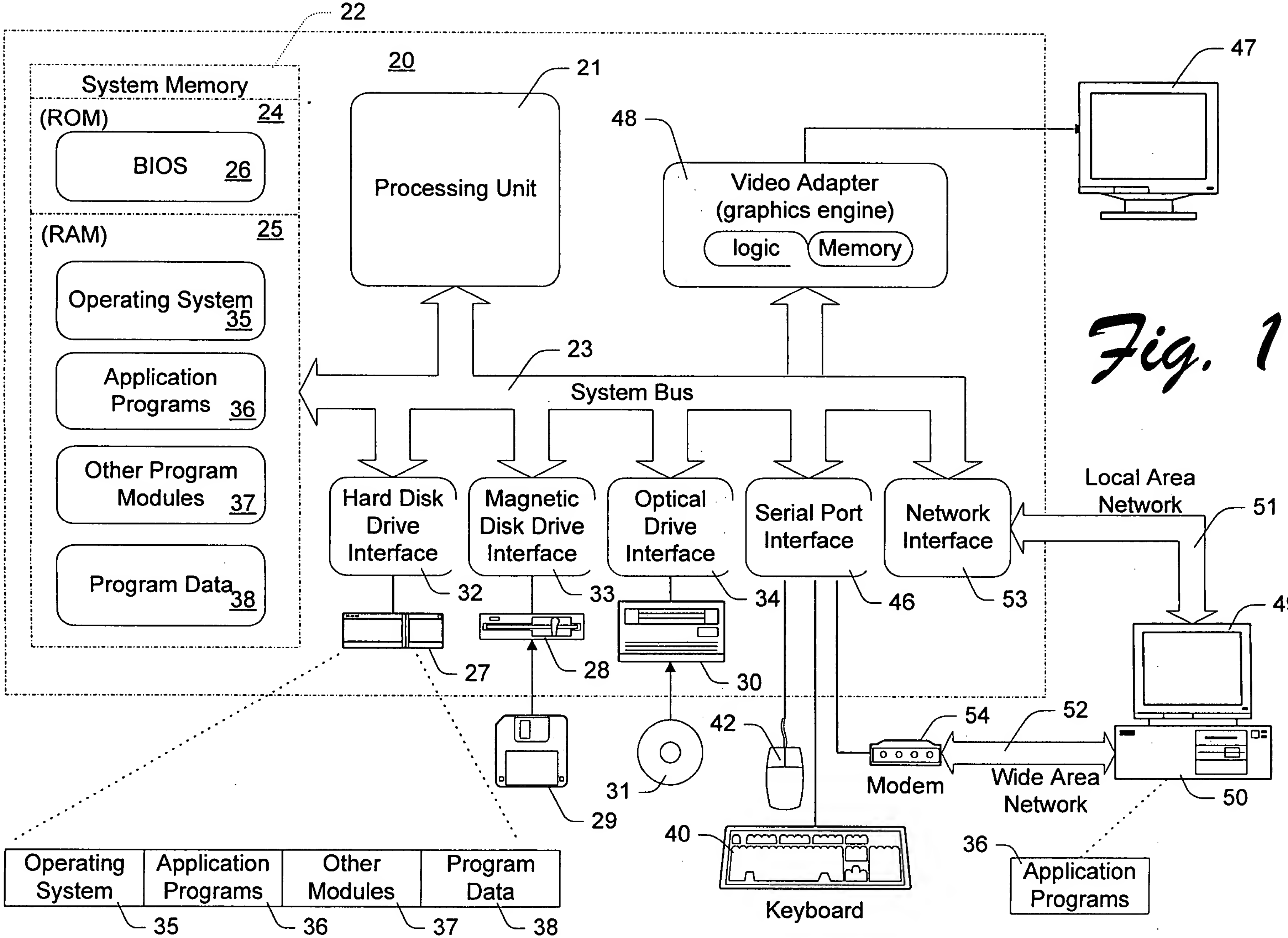
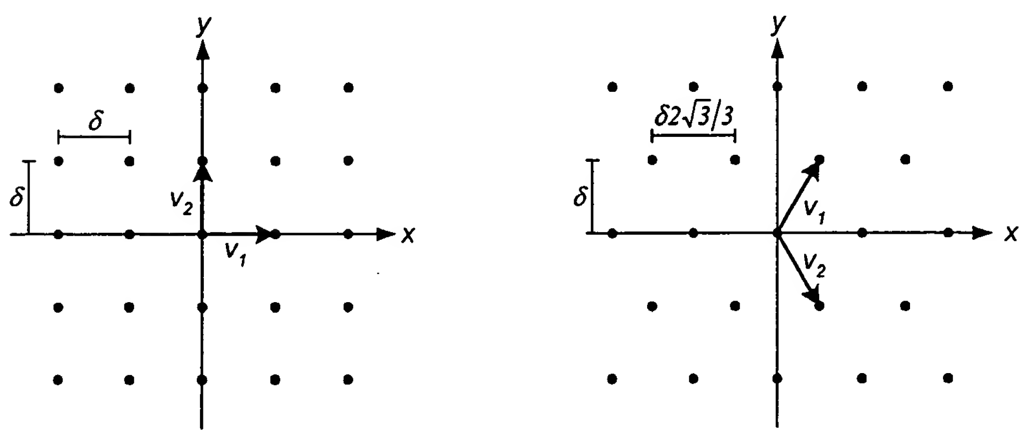

22
20
System Memory
(ROM) 24
BIOS 26
(RAM) 25
Operating System 35
Application Programs 36
Other Program Modules 37
Program Data 38
21
Processing Unit
48
Video Adapter (graphics engine)
logic
Memory
47
23
System Bus
Hard Disk Drive Interface
32
Magnetic Disk Drive Interface
33
Optical Drive Interface
34
Serial Port Interface
46
Network Interface
53
Local Area Network
51
49
27
28
30
29
31
42
40
Keyboard
54
Modem
52
Wide Area Network
50
36
Application Programs
Operating System
Application Programs
Other Modules
Program Data
35
36
37
38

Fig. 1

100

	Map name	Sampling Requirement	Minimum Isotropy	Map Components
	OpenGL	∞	0	1
102	Cube	24	0.58	6
	Dual Stereographic	32	1	2
	Lat/Long	19.7	0	1
	Dual Equidistant*	19.7	0.64	2
	Low Distortion Area Preserving*	19.7	0.29	1
104	Polar-Capped* (stretch invariant)	14.8	0.71	3
	Polar-Capped* (conformal)	16.5	1	3
	Polar-Capped* (hexagonally reparameterized)	13.5	0.58	3
106	Optimal Isometric**	12.57	1	∞
	Optimal**	10.9	0.58	∞

Fig. 2



(a) rectangular

(b) hexagonal

Fig. 3

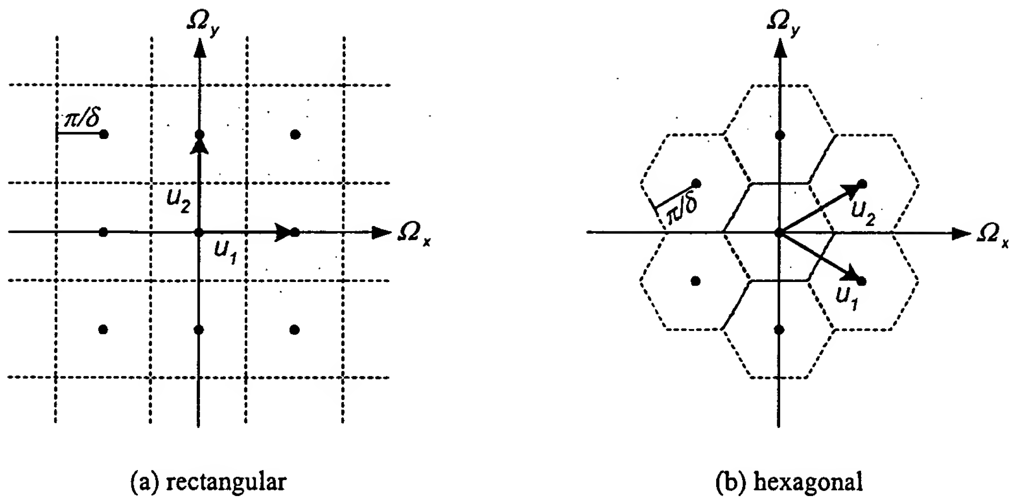

Ω_y
π/δ
u_2
u_1
Ω_x
(a) rectangular
Ω_y
π/δ
u_2
u_1
Ω_x
(b) hexagonal

Fig. 4

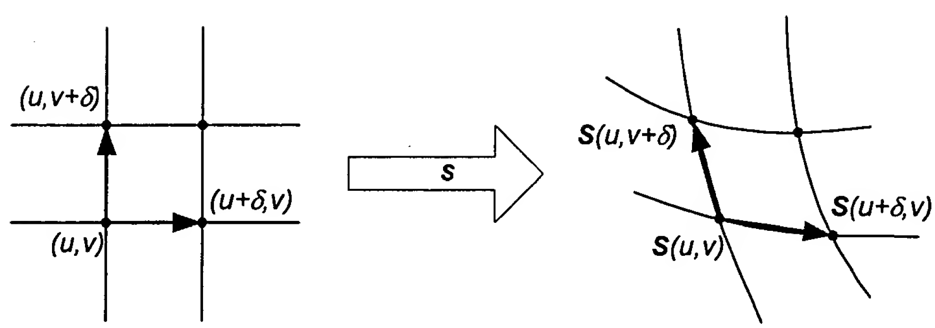

(u,v+δ)
(u+δ,v)
(u,v)
s
S(u,v+δ)
S(u+δ,v)
S(u,v)

Fig. 5

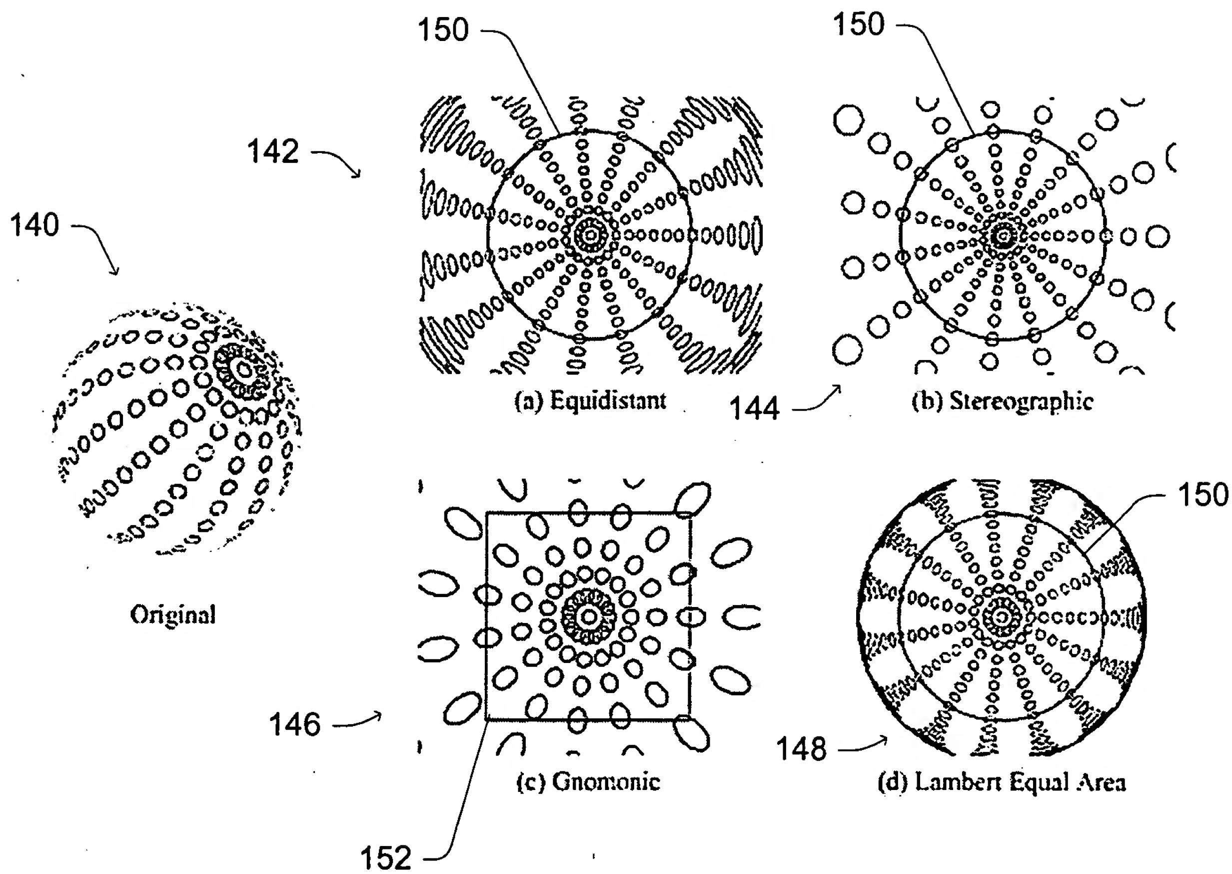

150
150
142
140
144
150
146
148
152
Original
(a) Equidistant
(b) Stereographic
(c) Gnomonic
(d) Lambert Equal Area

Fig. 6

200

	Equidistant	Gnomonic	Stereographic	Lambert Equal Area
$\theta(r)$	$(\pi/2)r$	$\cos^{-1}\left(\sqrt{1/(r^2+1)}\right)$	$\cos^{-1}\left((1-r^2)/(1+r^2)\right)$	$\cos^{-1}(1-r^2)$
properties	stretch-preserving	projects great circles to lines	conformal, projects circles to circles	area-preserving
r* covering hemisphere	[0, 1]	$[0, \infty]$	[0, 1]	[0, 1]
r* covering sphere	[0, 2]	–	$[0, \infty]$	$[0, \sqrt{2}]$
$r(\theta)$	$2\theta/\pi$	$\tan\theta$	$\tan(\theta/2)$	$\sqrt{1-\cos\theta}$
$\sin\theta$	$\sin((\pi/2)r)$	$r/\sqrt{r^2+1}$	$2r/(1+r^2)$	$r\sqrt{2-r^2}$
$\cos\theta$	$\cos((\pi/2)r)$	$\sqrt{1/(r^2+1)}$	$(1-r^2)/(1+r^2)$	$1-r^2$
$\lambda_1(\theta)$	$\pi/2$	$\cos\theta$	$1+\cos\theta$	$2/\sqrt{1+\cos\theta}$
$\lambda_2(\theta)$	$(\pi/2)\operatorname{sinc}\theta$	$\cos^2\theta$	$1+\cos\theta$	$\sqrt{1+\cos\theta}$
$\alpha(\theta)$	$\operatorname{sinc}\theta$	$\cos\theta$	1	$(1+\cos\theta)/2$
$\tau(\theta)$	$(\pi/2)^2\operatorname{sinc}\theta$	$\cos^3\theta$	$(1+\cos\theta)^2$	2
$\lambda_1^*(\theta)$	$\pi/2$	1	2	$2/\sqrt{1+\cos\theta}$
$M_S(\theta)$	$4\theta^2$	$4\tan^2\theta$	$16\tan^2(\theta/2)$	$16\tan^2(\theta/2)$
inverse map	$f=(\pi/2)\operatorname{sinc}(\cos^{-1}z)$ $u=x/f$ $v=y/f$	$u=x/z$ $v=y/z$	$u=x/(1+z)$ $v=y/(1+z)$	$u=x/\sqrt{1+z}$ $v=y/\sqrt{1+z}$

Fig. 7

500

	Plane Chart	**Equal Area**	**Mercator**
$\theta(v)$	$2\pi v$	$\sin^{-1} v$	$\sin^{-1}(\tanh(2\pi v))$
properties	stretch-preserving	area-preserving	conformal
v covering sphere	$[-1/4, 1/4]$	$[-1, 1]$	$[-\infty, \infty]$
$v(\theta)$	$\theta/(2\pi)$	$\sin\theta$	$\tanh^{-1}(\sin\theta)/(2\pi)$ $= \ln((1+\sin\theta)/(1-\sin\theta))/(2\pi)$
$\cos\theta$	$\cos(2\pi v)$	$\sqrt{1-v^2}$	$\operatorname{sech}(2\pi v)$ $= 2/(e^{-2\pi v} + e^{2\pi v})$
$\sin\theta$	$\sin(2\pi v)$	v	$\tanh(2\pi v)$ $= (e^{2\pi v} - e^{-2\pi v})/(e^{2\pi v} + e^{-2\pi v})$
$\lambda_1(\theta)$	2π	$\max(1/\cos\theta, 2\pi\cos\theta)$	$2\pi\cos\theta$
$\lambda_2(\theta)$	$2\pi\cos\theta$	$\min(1/\cos\theta, 2\pi\cos\theta)$	$2\pi\cos\theta$
$\alpha(\theta)$	$\cos\theta$	$\min(1/(2\pi\cos^2\theta), 2\pi\cos^2\theta)$	1
$\tau(\theta)$	$4\pi^2\cos\theta$	2π	$4\pi^2\cos^2\theta$
$\lambda_1^*(\theta)$	2π	$\max(1/\cos\theta, 2\pi)$	2π
$M_S(\theta)$	$2\pi\theta$	$\max(1/\cos^2\theta, 4\pi^2)\sin\theta$	$2\pi\tanh^{-1}(\sin\theta)$ $= \pi\ln((1+\sin\theta)/(1-\sin\theta))$
inverse map	$u = (\operatorname{atan2}(y,x))/(2\pi)$ $v = (\sin^{-1} z)/(2\pi)$	$u = (\operatorname{atan2}(y,x))/(2\pi)$ $v = z$	$u = (\operatorname{atan2}(y,x))/(2\pi)$ $v = \tanh^{-1} z/(2\pi)$ $= \ln((1+z)/(1-z))/(4\pi)$

Fig. 12

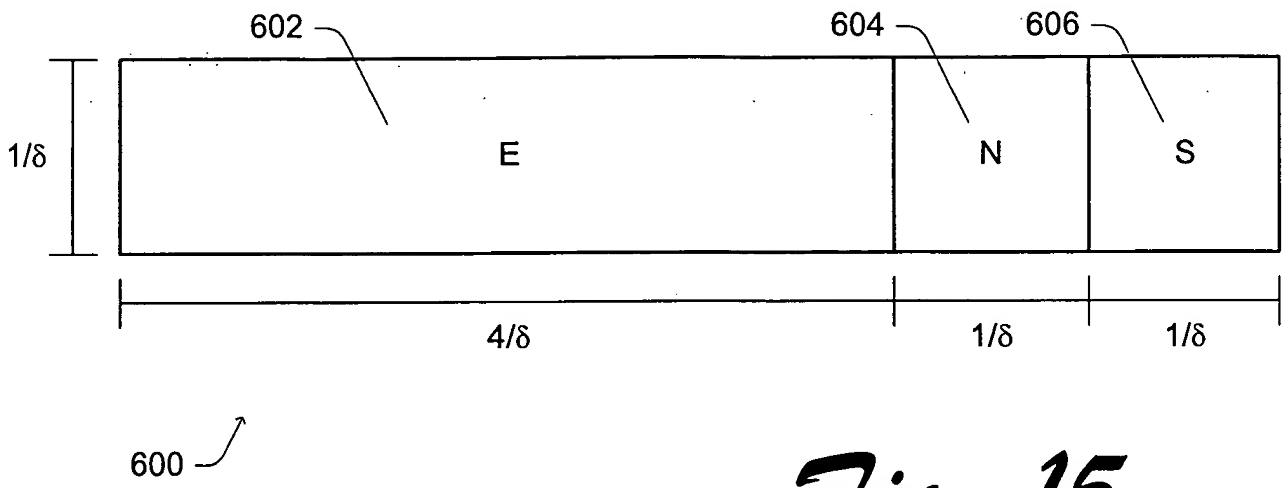
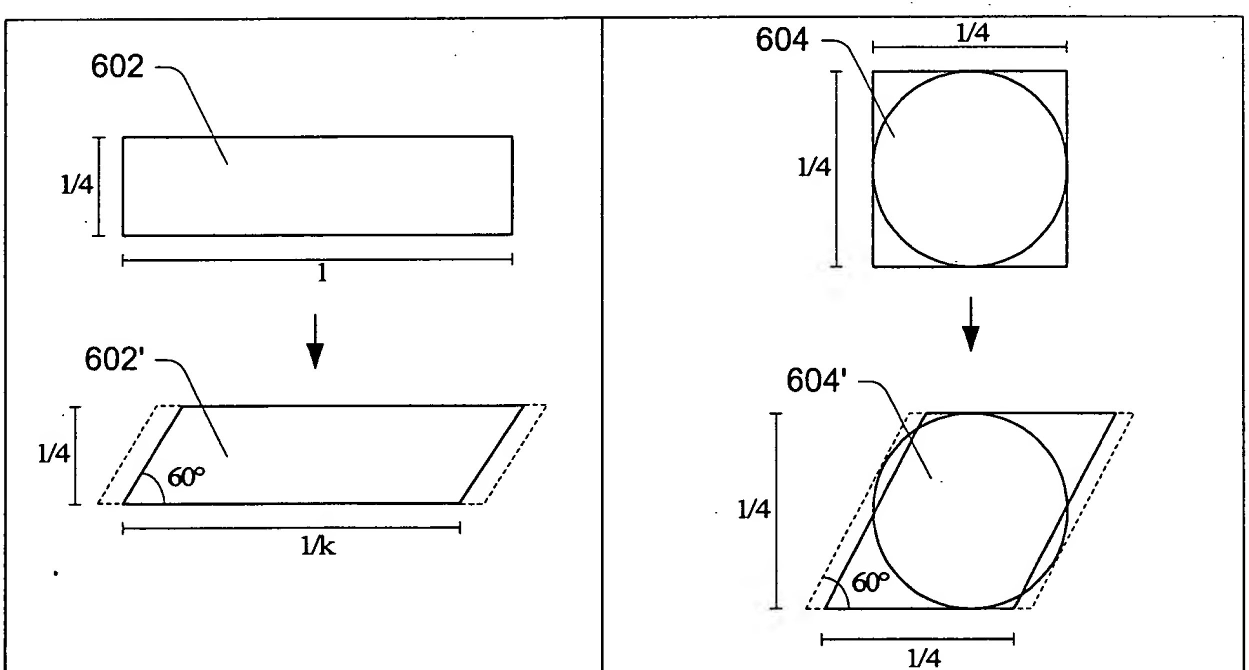


Fig. 15



(a) reparameterized equatorial domain

(b) reparameterized polar domain

Fig. 16